

COGNITIVE ASPECTS

Do We Act upon What We See? Direct Effects of Alcohol Cues in Movies on Young Adults' Alcohol Drinking

Renske Koordeman^{1,*}, Emmanuel Kuntsche², Doeschka J. Anschutz¹, Rick B. van Baaren¹ and Rutger C. M. E. Engels¹

¹Behavioural Science Institute, Radboud University, PO Box 9104, 6500 HE Nijmegen, The Netherlands and ²Addiction Info Switzerland, Research Institute, Lausanne, Switzerland

*Corresponding author. Tel: +31-24-361-1818; Fax: +31-24-361-2776; E-mail: r.koordeman@bsi.ru.nl

(Received 19 July 2010; in revised form 25 December 2010; accepted 7 March 2011)

Abstract — Aims: Ample survey research has shown that alcohol portrayals in movies affect the development of alcohol consumption in youth. Hence, there is preliminary evidence that alcohol portrayals in movies also directly influence viewers' drinking of alcohol while watching movies. One process that might account for these direct effects is imitation. The present study therefore examined whether young people imitate actors sipping alcohol on screen. **Methods:** We observed sipping behaviours of 79 young adults (ages 18–25) watching a 60-min movie clip, 'What Happens in Vegas', in a semi-naturalistic home setting. Each of the 79 participants was exposed to 25 alcohol cues. Two-level logistic regression analyses were used to analyse whether participants in general imitated actors' sipping during this clip. In addition, we applied proportional hazard models in a survival analysis framework (Cox regression) to test whether there was a difference in imitation of the cues between male and female participants, and to test whether the timing of the actors' sipping throughout the movie played a role. **Results:** The findings showed that participants were more likely to sip in accordance with the actors' sipping than without such a cue. Further, we found that men were more likely to imitate actors' sipping than females and that participants tended to respond to actors' sipping at the beginning of the movie rather than at the end. **Conclusion:** Exposure to actors sipping alcohol in a movie seems to have an immediate impact on the drinking behaviour of viewers, via the mechanism of imitation.

INTRODUCTION

Alcohol use among young people is widespread (Jernigan, 2001, Schmid *et al.*, 2003) and carries significant risk of alcohol-related harm, including car accidents and premature death (Valencia *et al.*, 2008). Early initiation of alcohol use leads to an increased risk for alcohol dependence and abuse later in life (DeWit *et al.*, 2000; Ellickson *et al.*, 2003; Kraus *et al.*, 2000). It is imperative to identify processes that influence heavy drinking to limit these negative consequences. Direct social influences, such as drinking peers and parents, have a substantial effect on young people's alcohol drinking (e.g. Spijkerman *et al.*, 2007). In addition, personality factors such as sensation seeking might affect young people's alcohol consumption (Sargent *et al.*, 2010). Evidence shows that exposure to alcohol cues in movies partially accounts for the onset and continuation of alcohol consumption among young people (e.g. Connally *et al.*, 1994; Hanewinkel and Sargent, 2009; Sargent *et al.*, 2006; Thomsen and Revke, 2006) and that these effects are independent of social influence of parents, friends and personality factors (Dal Cin *et al.*, 2009; Hanewinkel and Sargent, 2009). Young people often identify with alcohol-using movie characters, and celebrities and famous people often function as role models for them (Dal Cin *et al.*, 2008). Experimental studies of Engels *et al.* (2009) and Koordeman *et al.* (2011a,b) showed that movie alcohol portrayal also immediately affects alcohol consumption while watching a movie. However, not much is known about the processes behind drinking while watching a movie with alcohol cues. The present study examined whether young adults imitate alcohol sipping of movie characters while watching a movie.

Imitation of drinking behaviour has been proposed to account for alcohol consumption (Bandura, 1977; Larsen *et al.*, 2009a; Quigley and Collins, 1999). Empirical studies

have shown that drinking behaviour of an individual is often adapted to that of a role model (Caudill and Marlatt, 1975; Larsen *et al.*, 2009a,b; Lied and Marlatt, 1979; Quigley and Collins, 1999). Individuals consume more alcohol and with a higher pace when they are with someone who consumes alcohol (Caudill and Kong, 2001; Collins, *et al.*, 1985; Larsen, *et al.*, 2009a), thereby providing support for a role of alcohol consumption imitation in social settings. An underlying mechanism of this effect is behavioural imitation. Imitation is the tendency to act in the same way we see others act (Dijksterhuis and Bargh, 2001). First, at a behavioural level, research has shown that people often automatically, and outside their awareness, imitate each other's behaviour, including gestures, postures, laughter, moods and emotions (Chartrand and Bargh, 1999; Van Baaren, *et al.*, 2004a,b). At a cognitive level, observing someone perform a certain action (e.g. pick up a glass and sip) automatically activates the pre-motor representation of that action (the goal and the muscles involved) in our brains as if we were about to perform that action ourselves (e.g. Hurley and Chater, 2005). This imitation process might also apply to seeing actors drinking alcohol on screen.

Larsen *et al.* (2009b) showed that at a micro level (i.e. sipping level), individuals imitate the sips of alcoholic beverages of other people when in a bar lab. Will this micro-level imitation also occur when watching people on a TV screen without real-life interaction with the drinking model? Obviously, while watching a movie, individuals do not really interact with the actors on screen. However, movies are designed to involve people emotionally, and actors are selected for their ability to inspire empathy on the part of the viewer (Cohen, 2001). Therefore, the alcohol sipping of movie characters might influence young people, as previous research has shown that imitation is stronger when models are liked (Van Baaren *et al.*, 2003, 2004a,b).

The present study is the first to examine whether young adults imitate alcohol sipping of actors while watching a movie. In addition, we wanted to assess whether imitation of a cue depends on characteristics of the participants, such as their gender, and on characteristics of the cue, that is, the gender of the (drinking) actor and timing of the cue. To assess imitation processes, we observed participants in real time. We hypothesized that participants would imitate drinking of a character in a movie at a sipping level. Further, as there are profound gender differences in young adult drinking patterns (Bot *et al.*, 2005; Poelen, *et al.*, 2005), we expected the effects of alcohol portrayal in movies to be stronger for males compared with females.

METHODS

Participants and design

The sample consisted of 79 university students (51 males and 28 females) aged 18–25 years ($M = 20.8$, $SD = 2.0$) who watched a movie in same-sex dyads. This sample was part of a larger study investigating the effects of alcohol portrayals in movies on alcohol consumption (Koordeman *et al.*, 2011a). In this larger study, a randomized, two (gender) by two (movie condition: alcohol, non-alcohol) between-subject design was used (total, $n = 243$; alcohol movie condition, $n = 121$; non-alcohol movie condition, $n = 122$). Two 60-min versions of the same movie were created, one showing exclusively non-alcohol scenes and the other showing both male and female characters drinking alcohol in addition to non-alcohol scenes. Koordeman *et al.* (2011a) found that men's alcohol consumption was higher in the alcohol movie condition compared with the non-alcohol movie condition, whereas women's alcohol consumption was slightly lower in the alcohol movie condition compared with the non-alcohol movie condition.

In the present study, as we were exclusively interested in imitation of alcohol cues on screen, only participants who consumed alcohol at least once in the alcohol movie condition ($n = 79$) were included. When participants switched from alcoholic to non-alcoholic beverages, only the alcohol sips were included in the analyses. In the present study, the actual sample size does not comprise the participants but rather the movie cues ($n = 25$ cues multiplied by 79 participants = 1975).

Participants were recruited via flyers and an Internet system at the Radboud University Nijmegen. Through the Internet system, students could volunteer for participation in ongoing research. However, students enrolled in courses of study (e.g. psychology) were obliged to participate to receive a credit for a specific number of hours during their first year (Anschutz *et al.*, 2008). All participants were asked to come with a same-sex friend. Students received either Euros (~€12.50) or course credits. The Ethical Committee of the Faculty of Social Sciences of the Radboud University Nijmegen approved study protocols. Participants submitted written informed consent forms prior to the onset of the study.

Procedure

A semi-naturalistic home setting was created to increase ecological validity and minimize demand characteristics (Bot *et al.*, 2005). We placed a relaxing chair, plants,

television and decorations in a laboratory room. Sessions were conducted Tuesday through Friday in the late afternoon and lasted 1.5 h. First, participants filled out a questionnaire containing demographic questions and questions about how they spend their leisure time (to distract them from the real aim of the study). Next, they were informed that they would watch a movie for 1 hour, and they were asked to act as if they were at home. They were told that they could freely take nuts and drinks from the table and the refrigerator. Concerning beverages, participants could choose from beer, wine, soda or water in 20 cl or 25 cl bottles. The study was presented as an examination of general TV viewing behaviour, and no information was provided about the real aim of the study, that is, whether participants imitate actors sipping alcohol on screen. For a more detailed description of the study procedure, see Koordeman *et al.* (2011a).

The contemporary movie 'What Happens in Vegas' (Fox, 2008) was chosen for its numerous scenes containing alcohol portrayal. The movie is about two people who discover that they got married following a night of debauchery, with one of them winning a huge jackpot after playing the other's quarter. The unhappy couple tries to undermine each other and get their hands on the money, falling in love along the way. The actors Cameron Diaz and Ashton Kutcher played the main characters. Of the participants, 88.3% reported being familiar with Ashton Kutcher and 92.5% with Cameron Diaz before they watched the movie. As it was a recent release, not many participants would have seen it prior to the study. The movie was carefully shortened to 60 min in such a way that the storyline was still comprehensible. In the shortened version, the main male character, Jack, sipped alcohol 12 times, while the main female character, Joy, sipped alcohol 6 times. The supporting male character, Hater (friend of Jack), sipped 7 times. In total, characters sipped alcohol 25 times.

After watching the movie, participants completed a second questionnaire containing various questions about their attitude towards the movie, identification with main characters and their drinking habits. During each session, a hidden camera made DVD recordings. The participants were debriefed after data collection was completed. The participants who had consumed more than two alcoholic drinks were offered a taxi home.

Measures

Actors' sipping

First, we assessed how many times actors took a sip of any alcoholic beverage during the movie. Secondly, we examined at what time (in seconds) during the movie the actors took a sip.

Participants' sipping

We recorded at what time participants took a sip of alcoholic beverages. We synchronized the DVD recordings of the participants and the 60-min movie clip so that we could match exactly the sipping of the actors and the participants.

Further, we assessed the total number of participants' sips and total alcohol consumption by counting the number of alcoholic drinks consumed during the 60-min movie session (cf., Koordeman *et al.*, 2011a; Larsen *et al.*, 2009a).

Drinking habits (self-report)

To measure weekly alcohol use, we asked the following questions: ‘On how many days during the past 7 days did you consume alcohol?’ and ‘How many glasses did you drink?’ The total sum of the last 7 days was the measure used in the analyses (Hajema and Knibbe, 1998). Further, problem drinking (Cornel *et al.*, 1994) was assessed using six questions with possible responses of ‘yes’ or ‘no’. For example, ‘In the past twelve months, have you tried to stop drinking without succeeding?’ Cronbach’s α for this scale was 0.60.

Strategy for analyses

The first aim was to test whether people imitated actors’ sipping on screen during the 60-min movie. This would be the case when sipping of the participant occurred more often in the 15-s interval in which a cue (i.e. sipping of an actor in the movie) occurred rather than in the other 15-s intervals during the 60 min of the shortened movie. We chose a 15-s period from observational data on social drinking based on testing different time intervals (see also Larsen *et al.*, 2009b). Consequently, the 60-min movie was divided into 240 sequences of 15 s. The difference between the proportion of sips during any sequence and the proportion of sips in the time interval following an actor’s sipping was tested by means of a multilevel logistic regression analysis using the software package MPLUS 5.1 (Muthén and Muthén, 1998–2007). This analysis takes into account the clustering of movie sequences within individuals. Odds ratios were presented as effect sizes.

Secondly, we applied multilevel proportional hazard models (Cox regression) in a survival analysis framework using the software package MPLUS 5.1 (Muthén and Muthén, 1998–2007) to test whether imitation (i.e. possible event occurrence = sipping of a participant) within a 15-s time frame after a cue (=actor sipping in the movie) depends on characteristics of the participant, such as gender, or whether it depends on characteristics of the cue, such as timing (earlier or later in the movie) or gender of the cue. Hazard ratios and confidence intervals were presented as effect sizes.

RESULTS

Descriptives

Men and women differed substantially in self-reported alcohol consumption. Males reported a higher weekly consumption ($t(79) = 23.50$, $P < 0.001$) and scored higher on problem drinking compared with women ($t(79) = 8.29$, $P < 0.001$). While watching the movie, men consumed more alcohol compared with women ($t(79) = 28.61$, $P < 0.001$) and had a higher mean of total sips ($t(79) = 10.60$, $P < 0.001$). The intra-class correlation showed that in both male ($r = 0.515$) and female ($r = 0.754$) dyads participants’ alcohol consumption was significantly correlated ($P < 0.001$). The male and female correlations differed significantly ($z = -2.21$, $P = 0.027$). In five cases, only one of the two participants in a dyad was included in the analyses, since one consumed only non-alcoholic beverages. The means and SDs for all variables by gender are shown in Table 1.

Table 1. Descriptives: sample means (M) and standard deviations (SD)

	Total		Men		Women		T
	M	SD	M	SD	M	SD	
Alcohol consumption in cl (standardized) ¹	26.10	12.98	30.69	13.29	17.77	6.76	28.61**
Weekly alcohol consumption	16.62	15.02	21.12	16.06	8.43	7.90	23.50**
Problem drinking	1.19	0.21	1.22	0.22	1.14	0.19	8.29**
Total sips	24.77	21.46	28.24	22.50	18.46	7.82	10.59**

$N = 79$ (men = 51; women = 28).

** $P < 0.001$.

¹The results are given in glasses of 15 cl.

Do people imitate at all?

The first aim was to test whether people imitate actors sipping alcohol on screen during the 60-min movie. We found that the proportion of participants taking a sip during sequences outside actors’ sipping was 10.6%, whereas the proportion of participants taking a sip congruent with the actors’ sipping (i.e. within 15 s) was 14.3%. Multilevel logistic regression analysis showed that this difference was significant (odds ratio = 1.497, $P < 0.001$, 95% CI = 1.28–1.75). Thus, participants were more likely to sip when the actors were sipping rather than when the actors were not sipping.

Do men and women differ in imitation?

Multilevel Cox regression showed that men were more likely than were women to imitate an actor’s sip (hazard ratio = 1.97, $P = 0.003$, 95% CI = 1.36–3.09). In additional analyses, we controlled for self-reported weekly consumption, for total amount of sips (minus the sips within the imitation intervals of 15 s), and for the day of the week on which the experiment took place. While controlling for these variables, the effect of gender remained significant (hazard ratio = 1.85, $P = 0.016$, 95% CI = 1.10–2.98). Further, we did not find an interaction effect between gender of the participants and weekly drinking on imitation (hazard ratio = 1.02, $P > 0.05$, 95% CI = 0.98–1.06). There were no differences between high and low weekly drinkers in the interaction effect between condition and gender on imitation. In addition, we did not find a cross-level interaction between gender of the participant and gender of the actor on imitation (hazard ratio = 1.42, $P > 0.05$, 95% CI = 0.71–14.04). This means there was no difference between male and female participants on imitation of male and female actors.

Does timing of the cue affect imitation?

Regarding the timing of the actors’ sipping, it appeared that participants were more likely to imitate the actors’ sips at the beginning of the movie than at the end (hazard ratio = 0.80, $P = 0.037$, 95% CI = 0.63–0.98). We found no cross-level interaction between timing of the sipping and gender of the participants on imitation (hazard ratio = 1.17, $P > 0.05$, 95% CI = 0.358–1.43). Men and women both imitated more at the beginning of the movie.

DISCUSSION

The current study is the first to apply both logistic regression analysis and multilevel proportional hazard models (Cox regression) to assess the immediate effect of actors sipping alcohol on screen on young people's drinking behaviour. We found that young adults imitated the sipping of actors while they watched a movie. The results of the survival analyses further showed that men were more likely to imitate the alcohol sipping of an actor compared with women and that imitation of alcohol sips was stronger during the earlier period of the movie. The results contribute to the literature on the associations between alcohol portrayal in movies and alcohol consumption of young people (Connally *et al.*, 1994; Hanewinkel and Sargent, 2009; Sargent *et al.*, 2006). In addition, these results confirmed experimental studies demonstrating that individuals imitate the sipping behaviour of peers in real-life interactions (Larsen *et al.*, 2009a,b; Quigley and Collins, 1999). Hence, we demonstrated that even without real-life interaction with a model, direct imitation of sipping behaviour occurs. Cue-reactivity models might explain this imitation effect. In their incentive-sensitization theory, Robinson and Berridge (2004) stated that repeated use of a substance produces a dopaminergic response that becomes sensitized every time the drug is used. This sensitized reaction causes the substance to be perceived as highly salient. Attentional biases for alcohol cues and craving might be crucial factors underlying alcohol consumption (Franken *et al.*, 2003; Schoenmakers *et al.*, 2010), and alcohol cues in a movie might elicit attentional bias for alcohol and stimulate feelings of craving. This in turn might cause people to imitate characters on the screen.

Men were more inclined to imitate the actors' sipping compared with women. This result is in accordance with research on drinking in social groups and dyads, showing that modelling occurs more frequently among men (Bot *et al.*, 2007; Larsen *et al.*, 2009b; Overbeek *et al.*, 2010). Koordeman *et al.* (2011a) found that watching a version of a movie with many alcohol portrayals, in contrast to a version of the same movie without alcohol portrayals, leads to higher alcohol consumption during the movie for men but not for women. First, cue-reactivity can explain this gender difference. When confronted with alcohol cues in a movie, men might be more susceptible to these images as men rather than women are more often heavy drinkers (Neve *et al.*, 1997; Schuckit *et al.*, 1998). Many heavy drinkers have an attentional bias for alcohol cues, which might lead to increased craving and subsequent drinking (Field and Eastwood, 2005; Franken *et al.*, 2003). A second reason for the higher imitation likelihood in men might be that in the movie we chose, but also in movies in general, the male characters drink alcohol more frequently compared with the female characters (Everett *et al.*, 1998; Koordeman *et al.*, 2011a; Stern, 2005). Nonetheless, we did not find differences in imitation between male and female participants while watching male versus female actors. It might still be interesting in future studies to balance female and male actors' sipping in the movie to systematically explain the differences in imitation of male and female participants.

We further found that young adult participants imitated more during the earlier period of the movie. The sipping cues in this movie were evenly distributed over the length of

the movie. However, attentional bias for alcohol cues might be more profound when alcohol cues are viewed for the first time (first sip cue occurred 3 min into this movie clip). After the first few sips, the incentive saliency of alcohol cues probably diminishes (Schoenmakers and Wiers, 2010) for most people, and other processes might play a role in continued imitation of the sipping behaviour of actors. For instance, higher identification with the actors or transportation into the movie might lead to higher levels of imitation. Therefore, people might be more inclined to sip in accordance with the actors' sipping at the beginning of the movie rather than later in the movie. Another explanation for the difference in timing of imitation is that early alcohol cues in the movie might lead to overcoming inhibitions to alcohol consumption. When individuals have had their first drink, the following drinks are more likely to be consumed at the participant's own 'pace,' independent of the actors' drinking. Future studies should test the processes (e.g. identification, transportation, attentional bias) that affect the imitation of movie characters.

Some limitations and directions for future studies warrant attention. First, participants watched the movie in dyads, which may have affected their drinking behaviour. An important strength of this study is that we created a realistic drinking situation as possible and invited dyads to encourage participants to feel comfortable and 'at home', including having a drink while watching the movie. Of the participants, 85% reported watching movies with others. To really assess the effect of peer drinking, future studies could test the interplay between social and movie cues by using a design in which confederates are instructed to sip at specific moments. Further, it would be interesting to replicate the present study with individual participants to examine the effects of sipping cues in the movie independently from the effects of peers. Secondly, although based on qualitative impressions of the participants' behavioural patterns during the movie, the choices to divide the movie into 15-s sequences and to establish a 15-s time interval after the actor's sip are somewhat arbitrary. There are, as far as we know, no theoretical or empirical studies that have determined the exact period in which imitation can or should occur, particularly in the context of alcohol use. Therefore, we defined 15 s as an interval in which imitation might occur. Future studies should investigate the exact period in which imitation could occur.

Thirdly, it could be that the effects found occur especially when drinks are easily available in an experimental setting but may less likely occur when the drinks are not directly at hand. In a study using a truly naturalistic setting (i.e. a movie theatre), Koordeman *et al.* (2011b) demonstrated that alcohol advertisements presented in a movie theatre prior to a movie increased the consumption of alcohol among heavy drinkers. This study was conducted in a service cinema where participants were able to order (alcoholic) drinks during the movie. Future studies could test whether our results would be replicated in a truly naturalistic setting, for example, at the homes of participants. However, it is reasonable that when alcohol is less available or at a greater distance, for instance, when individuals have to walk to a fridge in the kitchen to get a drink or when they first have to go to the liquor shop when there is no alcohol at home, participants would not take a drink. Future research could test whether direct availability plays a role in alcohol consumption while watching

movies containing alcohol portrayal. Finally, it would be interesting to replicate this study with non-alcoholic beverages like soda to test whether participants also imitate characters in the movie drinking such beverages. Previous studies showed that television viewing increases consumption of sodas (Koordeman *et al.*, 2010; Thomson *et al.*, 2008; Vereecken *et al.*, 2005) and imitation might play a role in this behaviour.

In conclusion, the current study found that young people imitate movie characters' alcohol drinking on screen. Alcohol misuse among young people is a major public health concern worldwide (Rehm, *et al.*, 2010; WHO, 2010). Therefore, it is important to gain insight into processes that influence increased intake of alcohol. Using a micro perspective (i.e. sipping level), we demonstrated that alcohol portrayals in movies affect the drinking of young adults. People attempting to reduce their alcohol consumption could experience increased difficulty in limiting their consumption because alcohol portrayals in movies—in contrast to alcohol advertising—are expected to have an effect on drinking behaviour, even if that effect is outside a person's awareness. Alcohol portrayal in movies may be more powerful than advertising precisely because the message is not perceived as advertising (Petty and Cacioppo, 1986). Several national governments regulate alcohol advertising (STAP, 2010). However, few restrictions are placed on alcohol portrayal in movies. The use of an alcohol warning before the start of a movie could be a way to create more awareness. Some studies support the effects of anti-smoking advertisements before movies (Edwards *et al.*, 2007; Hanewinkel *et al.*, 2010; Harakeh *et al.*, 2010). However, it is not known if anti-smoking and anti-alcohol ads have the same effect on smoking and drinking behaviour. Another way to increase the awareness of the alcohol content in a movie could be the use an alcohol warning before the start of a movie. Further, movies that depicting alcohol could be broadcasted after prime time (Adams *et al.*, 2009), since this could reduce the frequency of exposure of adolescents and young adults to alcohol portrayals in movies.

In the present study, we tested the effect of imitation of actors' sipping in one-specific movie in a specific student population. Before generalizing the findings and making policy recommendations, the study should be replicated with different samples and different movies.

Conflict of interest statement. None declared.

Funding — Renske Koordeman was supported by the Dutch Organization for Scientific Research (NWO).

REFERENCES

- Adams J, Hennessy-Priest K, Ingimarsdottir S *et al.* (2009) Changes in food advertisements during 'prime-time' television from 1991 to 2006 in the UK and Canada. *Br J Nutr* **102**:584–93.
- Anschutz DJ, Engels RCME, Becker ES *et al.* (2008) The bold and the beautiful: influence of body size of televised media models in body dissatisfaction and actual food intake. *Appetite* **51**:530–7.
- Bandura A. (1977) *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Bot SM, Engels RCME, Knibbe RA. (2005) The effects of alcohol expectancies on drinking behaviour in peer groups: observations in a naturalistic setting. *Addiction* **100**:1270–79.
- Bot SM, Engels RCME, Knibbe A *et al.* (2007) Pastime in a pub: observations of young adults' activities and alcohol consumption. *Addict Behav* **32**:491–504.
- Caudill BD, Marlatt GA. (1975) Modeling influences in social drinking: an experimental analogue. *J Consult Clin Psychol* **43**:405–15.
- Caudill BD, Kong FH. (2001) Social approval and facilitation in predicting modeling effects in alcohol consumption. *J Subst Abuse* **13**:425–41.
- Chartrand TL, Bargh JA. (1999) The chameleon effect: the perception-behavior link and social interaction. *J Pers Soc Psychol* **76**:893–910.
- Cohen J. (2001) Defining identification: a theoretical look at the identification of audiences with media characters. *Mass Comm Soc* **4**:245–64.
- Collins RL, Parks GA, Marlatt GA. (1985) Social determinants of alcohol consumption: the effects of social interaction and model status on the self-administration of alcohol. *J Consult Clin Psychol* **53**:189–200.
- Connally GM, Casswell S, Zhang JF *et al.* (1994) Alcohol in the mass media and drinking by adolescents: a longitudinal study. *Addiction* **89**:1255–63.
- Cornel M, Knibbe RA, Van Zutphen WM *et al.* (1994) Problem drinking in a general practice population: the construction of an interval scale for severity of problem drinking. *J Stud Alcohol* **55**:466–70.
- Dal Cin S, Worth KA, Gerrard M *et al.* (2009) Watching and drinking: Expectancies, prototypes, and friends' alcohol use mediate the effect of exposure to alcohol use in movies on adolescent drinking. *Health Psychol* **28**:473–83.
- DeWit DJ, Adlaf EM, Offord DR *et al.* (2000) Drinking on television: a five year study. *J Drug Educ* **157**:745–50.
- Dijksterhuis A, Bargh JA. (2001) The perception-behavior expressway: automatic effects of social perception on social behavior. *Adv Exp Soc Psychol* **33**:1–40.
- Edwards CA, Oaks W, Bull D. (2007) Out of the smokescreen II: will an advertisement targeting the tobacco industry affect young people's perception of smoking in movies and their intention to smoke? *Tob Control* **16**:177–81.
- Ellickson PL, Tucker JS, Klein DJ. (2003) Ten-year prospective study of public health problems associated with early drinking. *Pediatrics* **111**:949–55.
- Engels RCME, Hermans R, Van Baaren RB *et al.* (2009) Alcohol portrayal on television affects actual drinking behaviour. *Alcohol Alcohol* **44**:244–9.
- Everett SA, Schnuth RL, Tribble JL. (1998) Tobacco and alcohol use in top-grossing American films. *J Community Health* **23**:317–24.
- Field M, Eastwood B. (2005) Experimental manipulation of attentional bias increases the motivation to drink alcohol. *Psychopharmacology* **183**:350–7.
- Fox A. (Writer) (2008) *What Happens in Vegas* (DVD). Los Angeles: Twentieth Century Fox Home Entertainment.
- Franken IHA, Rosso M, van Honk J. (2003) Selective memory for alcohol cues in alcoholics and its relation to craving. *Cognit Ther Res* **27**:481–8.
- Hajema KJ, Knibbe RA. (1998) Changes in social roles as predictors of changes in drinking behaviour. *Addiction* **93**:1717–27.
- Hanewinkel R, Sargent JD. (2009) Longitudinal study of exposure to entertainment media and alcohol use among German adolescents. *Pediatrics* **123**:989–95.
- Hanewinkel R, Isensee B, Sargent JD *et al.* (2010) Effect of an anti-smoking advertisement on cinema patrons' perception of smoking and intention to smoke: a quasi-experimental study. *Addiction* **105**:1269–77.
- Harakeh Z, Engels RCME, Vohs K *et al.* (2010) Exposure to movie smoking, antismoking ads and smoking intensity: an experimental study with a factorial design. *Tob Control* **19**:185–90.
- Hurley S, Chater N. (2005) *Perspectives on Imitation: from Neuroscience to Social Science*. Cambridge, MA: The MIT press.
- Jernigan DH. (2001) *Global Status Report: Alcohol and Young People*. Geneva: World Health Organization.

- Koordeman R, Anschutz DJ, Van Baaren RB *et al.* (2010) Exposure to soda commercials affects sugar-sweetened soda consumption in young women: an observational experimental study. *Appetite* **54**:619–22.
- Koordeman R, Anschutz JA, Van Baaren RB *et al.* (2011a) Effects of alcohol portrayal in movies on actual alcohol consumption: an observational experimental study. *Addiction* **106**: 547–54.
- Koordeman R, Anschutz DJ, Engels RCME. (2011b) Exposure to alcohol commercials in movie theaters affects actual alcohol consumption in young adult high weekly drinkers: an experimental study. *Am J Addiction* **20**:285–91.
- Kraus L, Bloomfield K, Augustin R *et al.* (2000) Prevalence of alcohol use and the association between onset of use and alcohol related problems in a general population sample in Germany. *Addiction* **95**:1389–401.
- Larsen L, Engels RCME, Granic I *et al.* (2009a) An experimental study on imitation of alcohol consumption in same-sex dyads. *Alcohol Alcohol* **44**:250–55.
- Larsen L, Engels RCME, Souren PM *et al.* (2009b) Peer influence in micro-perspective: imitation of alcoholic and non-alcoholic beverages. *Addict Behav* **35**:49–52.
- Lied ER, Marlatt GA. (1979) Modeling as a determinant of alcohol consumption: effect of subject sex and prior drinking history. *Addict Behav* **4**:47–54.
- Muthén LK, Muthén BO. (1998–2007) *Mplus User's Guide* (5th edn.). Los Angeles, CA: Muthén & Muthén.
- Neve RJM, Lemmens PH, Drop MJ. (1997) Gender differences in alcohol use and alcohol problems: mediation by social roles and gender-role attitudes. *Subst Use Misuse* **32**:1532–59.
- Overbeek G, Bot S, Sentse M *et al.* (2010). Where it's at! The role of best friends and peer group members in young adults' alcohol use. *J Res Adolesc*; doi: 10.1111/j.1532-7795.2010.00696.x.
- Petty RE, Cacioppo JT. (1986) *Communication and Persuasion: Central and Peripheral Routes to Attitude Changes*. New York: Springer.
- Poelen EAP, Scholte RHJ, Engels RCME *et al.* (2005) Prevalence and trends of alcohol use and misuse among adolescents and young adults in the Netherlands from 1993 to 2000. *Drug Alcohol Depend* **79**:413–21.
- Quigley BM, Collins RL. (1999) The modelling of alcohol consumption: a meta analytic review. *J Stud alcohol* **60**:90–8.
- Rehm J, Ballunas D, Borges GLG *et al.* (2010) The relation between different dimensions of alcohol consumption and burden of disease: an overview. *Addiction* **105**:817–43.
- Robinson TE, Berridge KC. (2004) Incentive-sensitization and drug 'wanting'. *Psychopharmacology* **71**:352–3.
- Sargent JD, Wills TA, Stoolmiller M *et al.* (2006) Alcohol use in motion pictures and its relation with early-onset teen drinking. *J Stud Alcohol* **67**:54–65.
- Sargent JD, Tanski S, Stoolmiller M *et al.* (2010) Using sensation seeking to target adolescents for substance use interventions. *Addiction* **105**:506–14.
- Schmid H, Ter Bogt T, Godeau E *et al.* (2003) Drunkenness among young people: a cross-national comparison. *J Stud Alcohol* **64**:650–61.
- Schoenmakers TM, Wiers RW. (2010) Craving and attentional bias respond differently to alcohol priming: a field study in the pub. *Eur Addict Res* **16**:9–16.
- Schoenmakers TM, De Bruin M, Lux IFM *et al.* (2010) Clinical effectiveness of attentional bias and modification training in abstinent alcoholic patients. *Drug alcohol depend* **109**:30–6.
- Schuckit MA, Daepfen JB, Tipp JE *et al.* (1998) The clinical course of alcohol-related problems in alcohol dependent and non-alcohol dependent drinking women and men. *J Stud Alcohol* **59**:581–90.
- Spijkerman R, Van den Eijnden R, Overbeek G *et al.* (2007) The impact of peer and parental norms and behavior on adolescent drinking: the role of drinker prototypes. *Psychol Health* **22**:7–29.
- STAP. *Regulation of Alcohol Marketing in Europe*. Utrecht: National Foundation for Alcohol Prevention 2007. Available at: http://www.alcoholreclame.nl/content/bestanden/elsa_2_r_on_regulation1.pdf (2 December 2010, date last accessed).
- Stern SR. (2005) Messages from teens on the big screen: smoking, drinking, and drug use in teen-centered films. *J Health Commun* **10**:331–46.
- Thomsen SR, Revke D. (2006) The relationship between viewing US produced television programs and intentions to drink alcohol among a group of Norwegian adolescents. *Scand J Psychol* **47**:33–41.
- Thomson M, Spence JC, Raine K *et al.* (2008) The association of television viewing with snacking behavior and body weight of young adults. *Am J Health Prom* **22**: 329–35.
- Valencia-Martin JL, Galan I, Rodriguez-Artalejo F. (2008) The joint association of average volume of alcohol and binge drinking with hazardous driving behaviour and traffic crashes. *Addiction* **103**:749–57.
- Van Baaren RB, Maddux WW, Chartrand TL *et al.* (2003) It takes two to mimic: behavioural consequences of self-construals. *J Pers Soc Psychol* **84**:1093–102.
- Van Baaren RB, Holland RW, Kawakami K *et al.* (2004a) Mimicry and prosocial behaviour. *Psychol Sci* **15**:71–4.
- Van Baaren RB, Horgan TG, Chartrand TL *et al.* (2004b) The forest, the trees and the chameleon: context dependency and mimicry. *J Pers Soc Psychol* **86**:453–9.
- Vereecken CA, Todd J, Roberts C *et al.* (2005) Television viewing behaviour and associations with food habits in different countries. *Public Health Nutrition* **9**:244–50.
- WHO (2010). *Best practice in Estimating the Costs of Alcohol—Recommendations for Future Studies*. Geneva: WHO (http://www.euro.who.int/data/assets/pdf_file/0009/112896/E93197.pdf, 2 December 2010, date last accessed).